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THE IMPACT OF FINANCIAL DEVELOPMENT ON INVESTMENT IN BOTSWANA: AN ARDL- BOUNDS TESTING APPROACH

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MODELLING LONG-RUN EQUILIBRIUM EXCHANGE RATE IN BOTSWANA

Brian Muyambiri¹ and Nicholas M. Odhiambo

Abstract

This paper examines the impact of both bank-based and market-based financial development on investment in Botswana during the period 1976 – 2012, using the autoregressive distributed lag (ARDL) bounds testing approach. The study adopts a flexible accelerator model, which enhances the relationship between financial development and investment. In order to capture the breadth and depth of the financial sector in the study country, the study makes use of bank- and market-based financial development indices. These are constructed from an array of bank- and market-based financial development indicators. The empirical results of this study show that while bank-based financial development has both a long-run and short-run positive impact on investment in Botswana, market-based financial development has no significant impact on investment, either in the short run or in the long run.

Keywords: Botswana, Investment, Bank-Based Financial Development, Market-Based Financial Development, Flexible Accelerator Model

JEL Classification Code: G10, G20, E22

1. Introduction

The current debate on African economic development has devoted much attention to the role of financial development through financial liberalisation so as to increase financial sector performance, which in turn is thought to accelerate economic growth. The relationship between financial development and investment is taken as given, that is financial development has a positive impact on investment, which in turn leads to increased economic growth. However, the theoretical and empirical investigation of

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the impact of financial development on investment has not received as much attention as that commanded by the finance-growth relationship.

Of the limited number of studies done on the finance-investment relationship, a considerable proportion have focused on developed countries, leaving most developing countries in general, and Botswana in particular, with little or no evidence. Many of these studies are also based on cross-sectional analysis, although it is now well known that results from such studies do not reflect country-specific effects.

Furthermore, previous studies on the finance-investment nexus over-relied on bank-based proxies of financial development, yet the financial sector consists of both bank- and market-based components. Also, the majority of the previous studies used residual-based cointegration tests or maximum likelihood tests, which are inappropriate if the sample is small. To the best of our knowledge, this may be the first study to evaluate in detail the impact of both bank-based and market-based financial development on investment – using time-series data from Botswana.

The remainder of the paper is organised as follows: Section 2 gives an overview of financial sector reforms in Botswana. Section 3 summarises the theoretical and empirical literature on financial development and investment. Section 4 presents the empirical model specification, the estimation technique and the empirical results, while Section 5 presents the conclusion to the study.

2. Financial Development in Botswana

Botswana has had its fair share of financial sector reforms. It started with a non-existent financial sector (before 1897), followed by being an extension of the South African financial sector (from 1897 onwards), until it eventually established its own financial system when the Bank of Botswana was established (1976) (Muyambiri & Odhiambo, 2015: 88).

Botswana's financial development history starts as early as 1897 when Standard Chartered Bank (then the Standard Bank of South Africa) established its first branch in Francistown to become the first bank to operate in Botswana (Bechuanaland Protectorate). However, it only operated for a few years due to difficult trading conditions. The Post Office Savings Bank (a subsidiary of the South Africa Post Office Bank) was then established in Botswana in 1911 (Muyambiri & Odhiambo, 2015: 90). However, commercial banks only fully incorporated themselves in the country in 1950.

Botswana had been part of the Rand Monetary Area since independence. The establishment of the central bank of Botswana was followed by the introduction of the national currency, the Pula in 1976 pegged to the USD at P1 being equal to USD1.15 and at par with the South African Rand (Bank of Botswana, 2016:5). The fundamental objectives of the Bank of Botswana, according to the Bank of Botswana Acts (1975, 1996), were (and are relatively still the same) the maintenance of monetary and price stability, a sound banking and financial system and an efficient payments mechanism (Muyambiri & Odhiambo, 2015: 90).

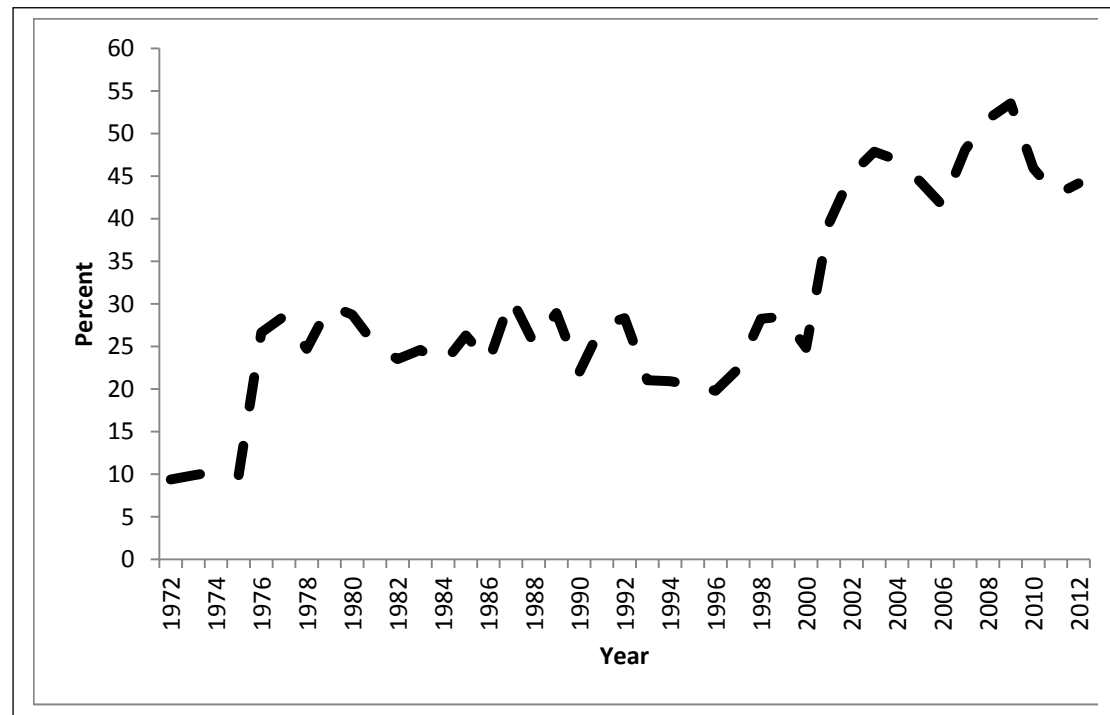
With the advent of the Bank of Botswana, banking regulation began in 1977 (Muyambiri & Odhiambo, 2015: 93). The central bank used its legislative powers to independently set interest rates on bank deposits and lending; fixed domestic liquidity requirements; and exchange control regulations (to curb imported inflation mainly from South Africa). In addition, the Bank of Botswana adopted a restrictive monetary policy by setting the prime lending rate and the commercial bank interest rate for each class of deposits (Moffat, 2008).

However in 1989, with the assistance of the World Bank, the Financial Policies for Diversified Growth document was completed and it provided the basis for far-reaching policy reforms (Bank of Botswana, 2016:4). These reforms included banking licenses being issued to any banks or group of investors, foreign or local, as long as they met certain minimum requirements, and all banks being independent and able to determine their own interest rates, fees and charges (Muyambiri and Odhiambo, 2015: 90).

The change in policy resulted in an increase in the number of banks in the market and the resultant competition led to a number of takeovers and mergers in the banking sector. The banking sector also expanded, as evidenced by the trends in the M2 to GDP ratio. Starting from a mere 10% in 1975, the M2 to GDP ratio has maintained levels above 20% from the mid-1990s. It even doubled to above 40% by 2009. Due to the repressive policy that tended to restrict rather than promote financial sector investment and business initiatives, the trends before 1992 showed stagnation in the advancement of the financial sector. After the changes in policy through financial liberalisation and following a number of mergers, acquisitions and closures during the

period 1992 to 1996, the financial sector began to ascend in importance. Figure 1 shows the trend in the M2 to GDP ratio.

Figure 1: Ratio of M2 to GDP in Botswana (1972-2012)

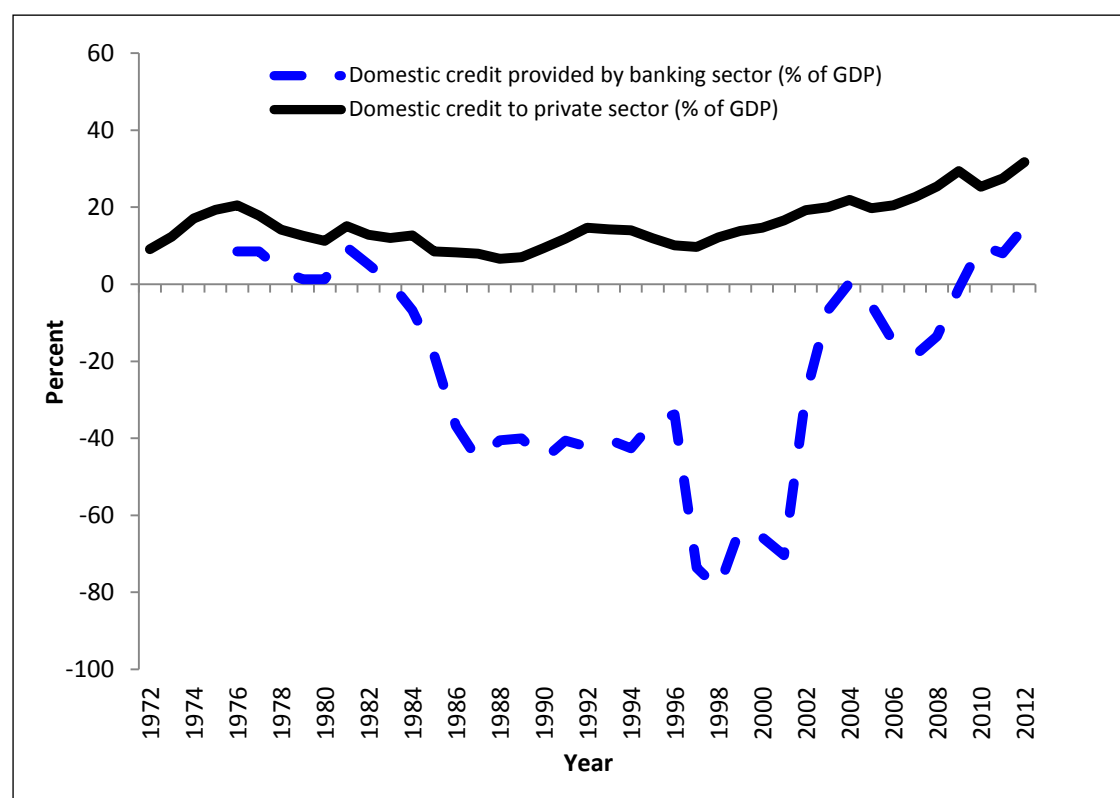


Source: IMF – IFS Statistics Compact Disc (2013)

Trends in credit show that the government was a huge net saver in the financial market, most probably due to increased revenues from precious mineral sales (see also Muyambiri and Odhiambo, 2015). Domestic credit to the private sector as a ratio of GDP increased from 1996 onwards after experiencing a downward trend following the establishment of the Bank of Botswana in 1976. However, the ratio of the net domestic credit to GDP shows that although the private sector was increasing its borrowing from commercial banks, the government was earning more money than it could spend. This led to the overall domestic credit scene showing excess liquidity in the market. Figure 2 illustrates trends in the banking sector as shown by credit

extension to the private sector (domestic credit to the private sector to GDP ratio) and to both the private sector and the public sector (net domestic credit to GDP ratio).

Figure 2: Trends in Credit Extension in Botswana (1972-2012)



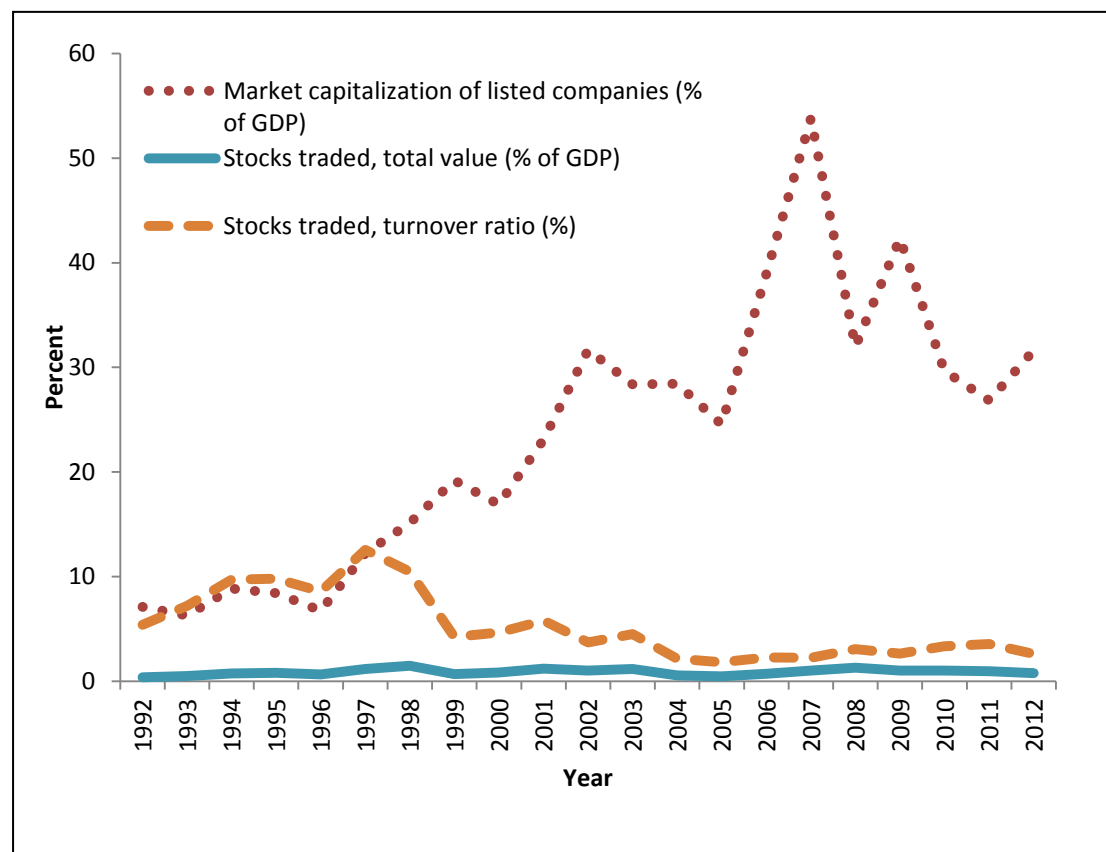
Source: *Financial Structure Database- Beck, Demirgüç-Kunt, & Levine (2000, 2010) Čihák, Demirgüç-Kunt, Feyen, and Levine (2012).*

On the market-based front, Botswana's financial system is still young and developing. Its stock market was established in 1989 and was originally known as the Botswana Share Market (BSM), with only five listed entities. In 1995, the Botswana Share Market became the Botswana Stock Exchange (BSE), following the BSE Act of 1994 (BSE, 2009: 4).

Currently, the Botswana Stock Exchange has 23 domestic companies, 14 foreign companies and more than 10 different private and government bonds listed

(Muyambiri *et al*, 2015: 90). Trends in the market capitalisation, stocks total value traded and turnover ratio show a gradual increase in market capitalisation, a decrease in the turnover ratio and an almost unchanged low total value traded as a percentage of GDP. Figure 3 shows the trends in market capitalisation, stocks total value traded and turnover ratio for Botswana. Market capitalisation has increased tremendously from a mere 7% in 1993 to 43% in 2007 but only gradually decreasing to 25% in 2011.

Figure 3: Market Capitalisation, Stocks Total Value Traded, and Turnover Ratio



Source: Financial Structure Database- Beck, Demirgüç-Kunt, & Levine (2000, 2010) Čihák, Demirgüç-Kunt, Feyen, and Levine (2012).

Since its establishment, the BSE has developed significantly, though in comparison to other countries worldwide, the Botswana Stock Exchange is still small (Bayraktar, 2014: 15, Moshabesha, 2011: 7).

3. Theoretical and Empirical Literature Review

Financial development can be defined functionally as involving improvements in producing information about possible investments and allocating capital; monitoring firms and exerting corporate governance; facilitation of trading, diversification and management of risk; mobilisation and pooling of savings; and easing the exchange of goods and services (Levine 2005:5). These functions of the financial system are taken to influence investment decisions and technological innovations through their influence on savings mobilisation, market organisation and centrality. The financial system, as a component of the economy, comprises a number of interrelated components, including the legal infrastructure, the markets and the institutions (Hawkins, 2006: 67). The importance of the financial sector is mainly explained in economics by the facilitation of investment through capital accumulation and the technological innovation that results in economic growth. Therefore, the link between financial development and investment is of paramount importance in assessing an economy's prospects in achieving sustainable economic growth.

It is postulated that financial markets arise due to market frictions. Therefore, market frictions that exist in the economy tend to result in the need for financial systems. Financial markets and intermediaries, by noticing the existing market frictions, react by supplying friction-mitigating services to the economy (Levine 2005:5). The provision of these services (management of liquidity risk, information acquisition and resource allocation, monitoring of investment projects, mobilisation of savings, facilitation of exchange and risk amelioration) leads to increased investment. The

alternative view postulates that economic agents demand these services and hence financial markets come into existence to satisfy the need.

Notably, most theoretical growth models propose that savings are translated into investment and investment leads to increased economic growth. Therefore, since savings mobilisation is one of the functional roles achieved through financial development, it is safe to conclude that financial development is important to achieving economic growth through its impact on investment. Growth models that connect financial development to investment include the Solow growth model and the endogenous growth models. For example, the Solow neoclassical growth model describes the important relationship between savings and investment.

On the empirical front, more studies confirm that financial development is positively related to investment. Benhabib and Spiegel's (2000) study of the role of financial development in growth and investment in four countries (Argentina, Chile, Indonesia and Korea) shows that the financial development indicators that are correlated with total factor productivity growth are different from those that impact investment. The period covered spans 1965 to 1985. The equation is based on the Solow growth model that is augmented to take into account issues of human capital vis-à-vis adoption of technology². Standard financial development indicators and other control variables are employed in the panel regression. The share of assets in the banking system, the gini coefficient-financial depth variable and the initial income financial depth variable are found to be significant and positively related to investment (physical capital accumulation).

² Benhabib and Spiegel adopt a Cobb – Douglas technology specification that reflects the importance of human capital as a source of technological innovation.

Ndikumana (2000) investigates the effects of financial development on domestic investment (total investment and private investment) in a sample of 30 sub-Saharan African countries for the period 1970 to 1995. The panel regression procedure is based on a dynamic serial correlation investment model that includes a number of indicators of financial development and a number of control variables. The control variables comprise the growth rate of real per capita GDP, government consumption, interest, international trade flows, inflation, external debt and the black market premium. Alternative specifications of the estimated model are assessed. Of importance is the testing of the accelerator-enhancing effect of financial development on investment by Ndikumana (2000). To test for the accelerator-enhancing effect, two separate alternative equations are used. In the first equation, an interaction term that equals the product of the growth rate of real per capita GDP and the index of financial development is included. In the second alternative, the investment equation is specified such that the response of investment to changes in output is a function of past levels of financial development. Results from the test of the accelerator effect show that higher financial development enhances the accelerator effects of an increase in real per capita GDP on investment. The sample of countries used by Ndikumana (2000) includes the country assessed in this study (Botswana). The main drawback of Ndikumana's (2000) study is that it does not investigate whether cross-country differences in financial development and the structure of financial systems have an effect on the ability of financial development to stimulate domestic investment. Moreover, Ndikumana (2000) also alludes to the fact that important country-specific aspects of the finance-investment link are unavoidably distorted in any analysis that

uses aggregate or panel data. However, the results of the study support the importance of financial development to investment.

Fowowe (2011), in a study of 14 Sub-Saharan African countries, states the objective of the study, following Ndikumana (2000) with the inclusion of the accelerator effect in the estimated equation and using a financial development index. The results support the accelerator theory of investment. The coefficients of output growth and financial development are positive and statistically significant, confirming the positive impact of these variables on private investment.

Jefferis (1995) investigates the role of the share market in financial and economic development in Botswana. The exploratory study used a number of variables that included stocks quoted, the market index, the US\$ Index, the real index, capitalization, time and savings deposits, market capitalization, the exchange rate, growth, real index growth, turnover, liquidity and inflation. Although Jefferis (1995) alludes to the fact that it is still too early to ascertain the effect of the stock market on investment, the study finds out that the stock market had a major impact on domestic institutional investment.

Matsheka (1998) analyses the interest rates and the saving-investment process in Botswana finds the supply of credit as having a positive effect on domestic investment through financial savings. The variables used in the study include the real deposit interest rate, real private sector credit, the lagged accelerator, and a dummy variable. Matsheka (1998) adopts an ordinary least squares estimation technique, based on the flexible accelerator model.

Ahmed (2006), while assessing the impact of financial liberalization policies for Botswana, finds that financial liberalisation positively impacts investment. Ahmed (2006) uses an exploratory methodology and adopts a number of variables that include private investment, public investment, gross national savings, private savings, public savings, credit to the private sector as a % of GDP, M3 and M2 as a % of GDP, and the real interest rate.

Lahcen (2004) reviews the impact of financial liberalisation on savings, investment and growth. The results of the study show the negative impact of financial depth on private investment. Real interest rates are found to have a positive effect on investment in the five Middle East and North African (MENA) countries investigated (Egypt, Jordan, Morocco, Tunisia and Turkey). The results are not consistent with theory³ and other empirical findings. The inconsistent results are explained by the fact that, although not empirically proven, financial development, has altered credit allocation in favour of households at the expense of the business sector. However, Lahcen (2004) seems to appropriately and alternatively use the various traditional indicators of financial development and financial liberalisation in assessing the effects of financial liberalisation on private investment. Notable amongst the indicators used are the total liquid liabilities of financial intermediaries as a percentage of GDP; deposit money banks assets as a share of total assets; private credit by deposit money banks to GDP; private credit by deposit money banks to total domestic credit; and a financial liberalisation index constructed on the basis of the eight main dimensions of financial reforms instituted in the MENA countries.

³ Theory stipulates a positive relationship between financial development and investment, and a negative relationship between real interest rates and investment.

However, Alem and Townsend (2014), in their study of the impact of financial institutions on consumption and investment, found that bank-based financial development has a negative impact on investment.

Despite being there limited empirical literature on the impact of financial development on investment, the conventional wisdom has been in favour of a positive impact of financial development – whether bank-based or market-based – on investment.

4. Empirical Model Specification, Estimation Techniques and Empirical Results

The model used in this study is a variant of the flexible accelerator model estimated by Ramirez (1994), Ndikumana (2000) and Schich and Pelgrin, (2002). Following Ndikumana (2000), financial development is hypothesised as reducing liquidity constraints for investors, thereby leading to an increase in capital stock as investors respond to the increase in aggregate demand (proxied in this study by the growth rate of the real per capita GDP). Therefore, higher financial development should be associated with stronger accelerator effects. The general model can be specified as follows:

$$INV_t = \rho_0 + \rho_1 DOG_t + \rho_2 BFDG_t + \rho_3 MFDG_t + \rho_4 RIR_t + \rho_5 SAV_t + \rho_6 INV_{t-1} + \varepsilon_t \dots\dots\dots 1$$

Where *INV* is the annual growth rate of the gross fixed capital formation (a proxy for the level of domestic investment), *DOG* is the growth rate of real per capita GDP (a proxy for desired real output growth), *BFDG* is the accelerator interaction term for bank-based financial development, *MFDG* is the accelerator interaction term for

market-based financial development, RIR is the the real interest rate, SAV is the gross domestic savings and ε -is the error term.

Following Ndikumana (2000), the indices for the bank-based and market-based financial development can be calculated using the following formula:

$$BFDG_{t-1} = \frac{1}{m} \sum_{j=1}^m \frac{BF_{j,t}}{\overline{BF_j}} \times DOG_{t-1}$$

where BF is a financial development indicator and DOG is the desired output growth. Three bank-based financial development indicators are used to calculate the bank-based financial development indicator (BFD) – namely liquid liabilities as a ratio of GDP (M3), domestic credit to private sector as a ratio of GDP and domestic credit provided by financial sector (% of GDP) as a ratio of GDP. Liquid liabilities (M3) are used as a measure of the size of the bank-based financial sector, while domestic credit to private sector measures the importance of banks in the supply of credit to the private sector. Domestic credit provided by the financial sector (% of GDP) measures the importance of banks in the supply of credit to the whole economy.

Three market-based financial development indicators are used to calculate the market-based financial development indicator ($MFDG$) – stocks traded, total value as a percentage of GDP; market capitalisation of listed companies as a ratio of GDP; and the turnover ratio. Market capitalisation of listed companies measures the market size, while stocks traded, total value complements the market capitalisation ratio by showing whether market size is matched by trading. The turnover ratio measures the total value of shares traded during the period, divided by the average market capitalisation for the period.

Multiplying each of these indices by the growth rate of real per capita GDP (a proxy for the rate of growth of the desired level of real output) gives the accelerator interaction terms for bank-based financial development (*BFDG*) and market-based financial development (*MFDG*).

The ARDL representation of equation 1 can be represented as follows:

$$\begin{aligned}\Delta INV_t = & \alpha_0 + \sum_{i=0}^n \alpha_{1i} \Delta DOG_{t-i} + \sum_{i=0}^n \alpha_{2i} \Delta BFDG_{t-i} + \sum_{i=0}^n \alpha_{3i} \Delta MFDG_{t-i} \\ & + \sum_{i=0}^n \alpha_{4i} \Delta RIR_{t-i} + \sum_{i=0}^n \alpha_{5i} \Delta SAV_{t-i} + \sum_{i=1}^n \alpha_{6i} \Delta INV_{t-i} \\ & + \sigma_1 DOG_{t-1} + \sigma_2 BFDG_{t-1} + \sigma_3 MFDG_{t-1} + \sigma_4 RIR_{t-1} + \sigma_5 SAV_{t-1} \\ & + \sigma_6 INV_{t-1} + \mu_{1t} \dots \dots \dots 2\end{aligned}$$

where all other variables are as defined previously, except: 1) Δ , which is the difference operator; 2) α_0 , which is a constant; 3) $\xi_1, \alpha_{i,1} - \alpha_{i,6}$ and $\sigma_{i,1} - \sigma_{i,6}$, which are the respective coefficients; and 4) μ_{1t} , which is the error term.

The ARDL bounds testing procedure has a number of distinct advantages as compared to the traditional cointegration tests. Since it is based on a single ARDL equation, it has the advantage of reducing the number of parameters to be estimated. In addition, restrictions on the number of lags can be individually applied to each variable. The ARDL approach also does not require pre-testing for the order of integration (0 or 1) of the variables used in the model. Compared to the Johansen and Juselius (1990) cointegration test, it has superior small sample properties (Pesaran and Shin, 1999).

The above model is estimated with the null hypothesis of no cointegration relationship, that is:

$$H_0: \sigma_1 = \sigma_2 = \sigma_3 = \sigma_4 = \sigma_5 = \sigma_6 = 0 \dots \dots \dots 8$$

Tested against the alternative hypothesis of the existence of a cointegration relationship:

$$H_1: \sigma_1 \neq \sigma_2 \neq \sigma_3 \neq \sigma_4 \neq \sigma_5 \neq \sigma_6 \neq 0 \dots \dots \dots 9$$

The null hypothesis indicates the non-existence of the long run relationship. The calculated F-statistic is validated against the lower and upper bound critical values (see Pesaran *et al*, 2001:300). If it is above the upper bound, the null hypothesis of no level effect is rejected. If it is below the lower bound, the null hypothesis of no level relationship cannot be rejected. If the calculated F-statistic lies between the bounds, the test is inconclusive.

Once the variables included in equation 2 have been found to be cointegrated, the following error-correction model will be estimated:

$$\begin{aligned} \Delta INV_t = & \alpha_0 + \sum_{i=0}^n \alpha_{1i} \Delta DOG_{t-i} + \sum_{i=0}^n \alpha_{2i} \Delta BFDG_{t-i} + \sum_{i=0}^n \alpha_{3i} \Delta MFDG_{t-i} \\ & + \sum_{i=0}^n \alpha_{4i} \Delta RIR_{t-i} + \sum_{i=0}^n \alpha_{5i} \Delta SAV_{t-i} + \sum_{i=1}^n \alpha_{6i} \Delta INV_{t-i} \\ & + \xi_1 ECM_{t-1} + \mu_t \dots \dots \dots 3 \end{aligned}$$

Where all variables are as defined, with the exception of ECM-1, which is the error correction term lagged one period. where all other variables are as defined previously, with the exception of the coefficient (ξ_1) of the error-correction term lagged one

period (ECM-1). The coefficient of the error-correction term lagged one period (ECM-1) is expected to be negative and statistically significant.

The study uses data covering the period 1976 to 2014. The main data source is the World Development Indicators (World Bank, 2015). All the series except liquid liabilities were obtained from this source. Liquid liabilities data came from the Global Financial Development Data (World Bank, 2015).

4.1 Empirical Results

4.1.1 Unit Root Tests

Before estimating the models, it is important to test for the stationarity of the variables and where the variables are not stationary in levels appropriate differencing has to be done until the variables become stationary. Since the ARDL bounds test can only be employed when all our variables are integrated of an order equal to one or less, confirming the order of integration is done with the aid of unit root tests. In this study, the unit root tests were conducted using the Augmented Dickey-Fuller Generalised Least Square, Perron (1997) PPURoot and Ng-Perron Modified unit root tests. The null hypothesis being tested is that the relevant series is not stationary against the alternative that the series is stationary. The unit root results of the variables are shown in Table 1.

Table 1: Unit Root Tests

DICKEY-FULLER GENERALISED LEAST SQUARE (DF-GLS)					PERRON (1997) UNIT ROOT TEST (PPUR00T)			
Variable	Stationarity in levels		Stationarity in differences		Stationarity in levels		Stationarity in differences	
	With intercept, no trend	With intercept and trend	With intercept, no trend	With intercept and trend	With intercept, no trend	With intercept and trend	With intercept, no trend	With intercept and trend
INV	-2.171258 **	-2.373902	-	-4.540641 ***	-6.34879***	-6.640844***	-	-
DOG	-4.521342 ***	-5.450692 ***	-	-	-6.3130***	-6.2841***	-	-
BFDG	-1.783048 *	-2.042641	-	-11.08675 ***	-6.492175***	-7.008896***	-	-
MFDG	-4.096175 ***	-4.941239 ***	-	-	-5.699415**	-5.187857	-	-6.449631 ***
RIR	-3.327600 ***	-3.644984 ***	-	-	-3.968692	-5.144123	-6.044555	-5.96344***
SAV	-2.103745**	-2.549075	-	-5.565355***	-4.014	-4.325	-6.395***	-6.245***
NG-PERRON MODIFIED UNIT ROOT TEST								
	MZa				MZt			
Variable	Stationarity in levels		Stationarity in differences		Stationarity in levels		Stationarity in differences	
INV	-7.38274 *	-8.50450	-	-17.3185 *	-1.89837 *	-2.06065	-	-2.88313 *
DOG	-17.4183***	-18.755**	-	-	-2.9325***	-3.061**	-	-
BFDG	-5.21837	-6.85783	-14.2389 ***	-18.904**	-1.61483	-1.83004	-2.62054 ***	-3.073**
MFDG	-9.31179 **	-9.30294	-	-22.4661 **	-2.15444 **	-2.14280	-	-3.35079 **
RIR	-12.6310 **	-13.9939	-	-40.5868 ***	-2.51231 **	-2.61392	-	-4.49640 ***
SAV	-7.8137*	-11.467	-	-18.272*	-1.822*	-1.973	-	-2.697*
	MSB				MPT			
Variable	Stationarity in levels		Stationarity in differences		Stationarity in levels		Stationarity in differences	

INV	0.25714 *	0.24230	-	0.16648 **	3.40163 *	10.7197	-	5.61642 *
DOG	0.16836***	0.16324**	-	-	1.47437***	4.86282**	-	-
BFDG	0.30945	0.26685	0.18404 **	0.16257**	4.69617	13.3073	1.90116 **	4.82734**
MFDG	0.23137 **	0.23034	-	0.14915 **	2.64348 **	9.84738	-	4.06065 **
RIR	0.19890 **	0.18679	-	0.11078 ***	1.94260 **	6.68968	-	2.28936 *****
SAV	0.23330*	0.17207	-	0.14117***	3.68606*	9.93035	-	7.46748*

Note: *, ** and *** denote stationarity at the 10%, 5% and 1% significance levels respectively

All the variables under consideration are at most integrated of order 1. Therefore, given the confirmation of the order of integration to be at most 1, the next step is to test the possibility of cointegration among the variables using the ARDL bounds testing procedure.

4.1.2 Cointegration – ARDL Bounds Testing Approach

The ARDL bounds testing approach to cointegration tests the existence of cointegration between the variables for the existence of a long-run relationship. The empirical results of the ARDL bounds tests for cointegration are reported in Table 2.

Table 2: Bounds F-Test for Cointegration

Dependent Variable	Function		F-statistic		Cointegration Status	
INV	F(INV DOG, BFDG, MFDG, RIR, SAV)		3.9044*		Cointegrated	
Asymptotic Critical						
	1%		5%		10%	
<i>Pesaran et al. (2001:301) Table CI (v) Case V</i>	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	3.93	5.23	3.12	4.25	2.75	3.79

Note: *, ** and *** denotes significance at the 10%, 5% and 1% significance levels respectively

The results indicate that the computed F-statistic is greater than the upper critical bound at the 10% level of significance. This implies that there is cointegration between the series and it confirms that investment, growth, bank-based financial development, market-based financial development, savings and real interest rates are cointegrated over the study period. Following the confirmation of cointegration, the optimal lag selected based on the Schwarz Bayesian Criterion (SIC) is lag 2. The SIC was used because it was found to be more parsimonious than the other information criteria.

4.1.3 Long Run and Short Run Coefficients

Table 3 gives the estimated long run and short run coefficients in Panel A and Panel B, respectively.

Table 3: Estimated Long Run and Short Run Coefficients

PANEL A: ESTIMATED LONG RUN COEFFICIENTS - Dependent Variable is INV

Regressor	Coefficient	t-ratio (prob)
DOG	-0.74635*	-1.8333(0.094)
BFDG	0.69970*	1.9849(0.073)
MFDG	1.2989	0.93193(0.371)
RIR	-0.072803	-0.38309(0.709)
SAV	-0.18055	-1.0696(0.308)
Constant	28.0959***	3.3920(0.006)
Trend	0.42622**	2.6684 (0.022)

PANEL B: ESTIMATED SHORT RUN COEFFICIENTS - Dependent Variable is D. INV

dINV1	0.21725	0.98619(0.345)
dDOG	-0.71111**	-2.7648(0.018)
dBFDG	0.66665**	2.3280(0.040)
dMFDG	1.2375	1.0634(0.310)
dRIR	-0.069365	-0.36573(0.722)

dSAV	-0.17202	-0.93769(0.369)
dT	0.40609*	2.0571(0.064)
ecm (-1)	-0.95277**	-2.8690(0.015)

Note: *, ** and *** denotes significance at the 10%, 5% and 1% significance levels respectively

Panel A of Table 3 reveals that, in the long run, the coefficient of bank-based financial development is positive and statistically significant. This implies that for Botswana there is a long-run positive accelerator enhancing relationship between bank based financial development and investment. All other regressors, with the exception of the desired output growth, constant and trend term, are also found to be insignificant in the long run.

The results for the short-run coefficients (Panel B) show that the coefficient of bank-based financial development is also positive and statistically significant, as expected. Thus an increase in the level of bank-based financial development leads to an increase in investment in the short run. The coefficient of the level of desired real output growth is found to be negative and statistically significant. Therefore, an increase in the level of desired output growth leads to a decrease in investment in the short run in Botswana. The coefficient of the trend term, both in the long run and in the short run, is positive and statistically significant. The coefficient on T is an estimate of the amount by which the function is shifting in each period. The coefficient of market-based financial development is insignificant both in the short run and in the long run. This implies that market-based financial development does not have any impact on investment in Botswana. Accordingly, for both the long run and the short run, bank based financial development has a positive impact on investment in Botswana.

Therefore, the composition, behaviour, and size of the banking industry, the relatively small and illiquid capital markets, and the presence of consistent government surpluses appear to be the main reasons for bank-based financial development in Botswana being a significant contributor to investment within the accelerator framework/conditions. The coefficient of the lagged error correction term (ECM_{t-1}) is also found to be negative and significant, as expected.

The associated diagnostic tests for the estimated model are given in Table 4, while the associated stability tests based on the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMQ) are reported in Figures 4 and 5. The reported CUSUM and CUSUMQ show that the model is stable, and confirms the stability of the long-run coefficients of regressors.

Table 4; ARDL – VECM Diagnostics Tests

TEST STATISTICS	LM VERSION	PROB. VALUES	F VERSION	PROB. VALUES
A: Serial Correlation	0.50629	0.477	0.25972	0.621
B: Functional Form	3.9864	0.046	2.4894	0.146
C: Normality	4.0817	0.130	<i>Not applicable</i>	
D: Heteroscedasticity	0.085182	0.770	0.076992	0.785

Figure 4: Plot of Cumulative Sum of Recursive Residuals

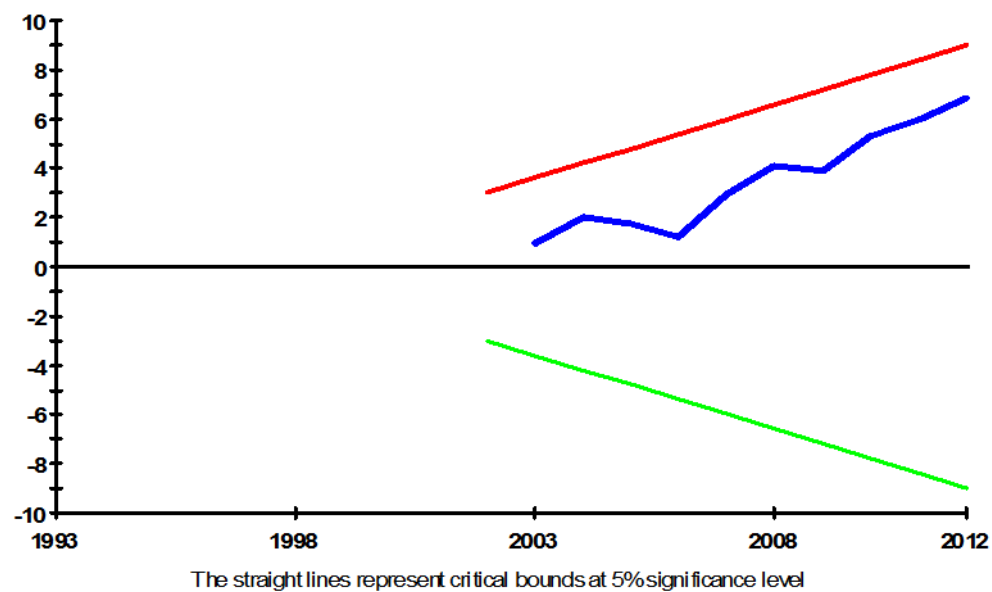
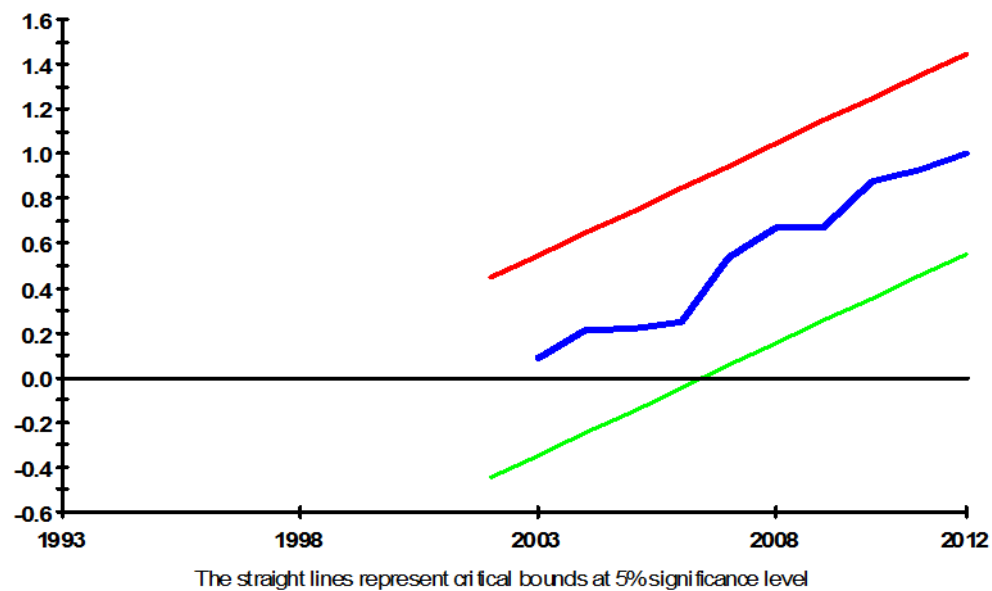


Figure 5: Plot of Cumulative Sum of Squares of Recursive Residuals



5. Conclusion

In this paper, the relative impact of bank-based and market-based financial development on investment in Botswana during the period 1976 to 2012 has been

examined using the ARDL bounds testing procedure. The study adopts a flexible accelerator model, which enhances the relationship between financial development and investment. In order to capture the breadth and depth of the financial sector in the study country as far as possible, the study makes use of bank- and market-based financial development indices constructed from an array of bank- and market-based financial development indicators. Despite Botswana being one of the countries in Southern Africa that has a relatively developed financial sector, the results from the investigation show that only bank-based financial development has a significant positive accelerator enhancing effect on the level of investment in both the long run and the short run. The significance of bank-based financial development can be explained by the well-established bank-based financial market, as compared to the relatively recently established market-based financial market.

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